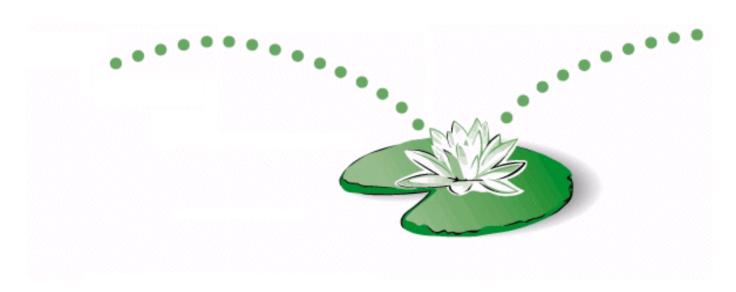
Evaluation of Clinical Decision Support Functionalitywith the Leapfrog CPOE Flight Simulator



Tuesday June 6, 2006

David C Classen MD, M.S.

Can CPOE Cause Errors?



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DRAFT

ORIGINAL CONTRIBUTION

Role of Computerized Physician Order Entry Systems in Facilitating Medication Errors

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DIMENSI DRUG EVENTS (ADES)
are estimated to injure or kill
more than 17 0 000 people in
hospitals annually. Prescribing errors are the most frequent
source. ²⁴ Computerized physician order entry (CPOE) systems are widely

Content: Hospital computertradiphysician order entry (CPOE) systems are widely regarded as the technical solution to medication ordering errors, the largest identified source of preventable hospital medical error. Published studies report that CPOE reduces medication errors up to 81%. Few researchers, however, have focused on the existence or types of medication errors facilitated by CPOE.

Objective To identity and quantity the role of CPOE in taditating prescription error risks.

Design, Settling, and Participants. We performed a qualitative and quantitative study of house staff interaction with a CPOE system at a tertiary-cure teaching hospital (2002-2004). We surveyed house staff (N=261; 88% of CPOE users); conducted 5 focus groups and 32 interaive one-one interviews with house staff, information technology leaders, pharmacy leaders, attending physicians, and nurse; shadowed house staff and nurses; and observed them using CPOE. Purticipants included house staff, nurses, and hospital leaders.

Main Outcome Measure Examples of medication errors caused or exacerbated by the CPOE system.

PEDIATRICS

Unexpected Increased Mortality After Implementation of a Commercially Sold Computerized Physician Order Entry System

Scott Watson, Trung C. Nguyen, Hülya Bayir and Richard A. Orr

Yong Y. Han, Joseph A. Carcillo, Shekhar T. Venkataraman, Robert S.B. Clark, Richard A Orr.

Pediatrics 2005;116;1506-1512

Leapfrog Computer Physician Order Entry (CPOE) Inpatient Standard

Each hospital fulfilling this Leap:

- Assures that prescribers* enter hospital medication orders (75%) via a computer system that includes decision support software to reduce prescribing errors;
- Requires that prescribers electronically document a reason for overriding an interception prior to doing so.
 - ✓* "Prescribers" used throughout this section refers to all clinicians authorized by the hospital to order pharmaceuticals for patients.
- Demonstrates, via a test (now <u>almost complete</u> by the First Consulting Group and the Institute for Safe Medication Practices), that their inpatient CPOE system can alert physicians to at least 50% of common serious prescribing errors. This criterion for the leap will not count towards your hospital's publicly reported status on this leap until the test is available (January 1, 2007, Limited Release July 2006)

Leapfrog Ambulatory Standards 2006



- Physician office adopts and uses an electronic system which includes all of the following:
 - Decision support based on drug reference information
 - Decision support which draws from a patient-specific database which includes age, weight, medications prescribed by that office, diagnoses, allergies, specified lab results, and electronically-available formulary information; inclusion of medications prescribed by other physicians is encouraged, but optional
 - Printing of a paper prescription or its NCPDP-compliant electronic transmission to the pharmacy
- Physician office adopts and uses an electronic system which includes all of the following:
 - Tracking whether results have been reviewed by the practice
 - Tracking whether results have been communicated to the patient, either electronically or via telephone or regular mail
 - Storage and retrieval of LOINC-compliant lab results reports (excepting microbiology) in database-structured format
- Physician office adopts and uses an electronic system which includes all of the following:
 - Patient-specific database which includes age, gender, diagnoses, treatment codes, lab test results, and medications documented by a clinician, AND
 - Specified reminders for clinicians drawn from current US Preventive Services Task Force and other nationally recognized care guidelines (Appendix B)

Leapfrog CPOE Flight Simulator





CPOE Standard Evaluation Methodology Description of Order Categories



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Order Category	Description	Examples
Therapeutic duplication	Medication with therapeutic overlap with another new or active order; may be same drug, within drug class, or involve components of combination products	Codeine AND Tylenol #3
Single and cumulative dose limits	Medication with a specified dose that exceeds recommended dose ranges or that will result in a cumulative dose that exceeds recommended ranges	Ten-fold excess dose of Methotrexate
Allergies and cross-allergies	Medication for which patient allergy has been documented or allergy to other drug in same category has been documented	Penicillin prescribed for patient with documented Penicillin allergy
Contraindicated route of administration	Order specifying a route of administration (e.g., oral, intra- muscular, intravenous) not appropriate for the identified medication	Tylenol to be administered intravenously
Drug-drug interaction	Medication that results in known, dangerous interaction when administered in combination with a different medication in a new or existing order for the patient	Digoxin AND Quinidine
Contraindication / dose limits based on patient diagnosis ©2006 First Consulting Group	Medication either contraindicated based on patient diagnosis or diagnosis affects appropriate dosing Page 7	Nonspecific beta blocker in patient with asthma

CPOE Standard Evaluation Methodology Description of Order Categories (cont)



Order Category	Description	Examples
Contraindication dose limits based on patient age and weight	Medication either contraindicated for this patient based on age and weight or for which age and weight must be considered in appropriate dosing	Adult dose of antibiotic in a newborn
Contraindication / dose limits based on laboratory studies	Medication either contraindicated for this patient based on laboratory studies or for which relevant laboratory results must be considered in appropriate dosing	Normal adult dose regimen of renally eliminated medication in patient with elevated creatinine
Contraindication / dose limits based on radiology studies	Medication contraindicated for this patient based on interaction with contrast medium in recent or ordered radiology study	Medication prescribed known to interact with contrast medium in ordered head CT exam
Corollary	Intervention that requires an associated or secondary order to meet the standard of care	Prompt to order drug levels when ordering Dilantin
Cost of Care	Test that duplicates a service within a timeframe in which there is typically minimal benefits from repeating the test	Repeat test for Digoxin level within 2 hours
Nuisance ©2006 First Consulting Group	Order with such a mild or typically inconsequential interaction that clinicians typically ignore the advice provided Page 8	Lasix AND Digoxin in patient with normal potassium

Leapfrog Ambulatory EHR Standard 2006 Appendix B: Specified Reminders



CAD:

- Aspirin and beta blocker use
- Lipid measurement/management
- ACE inhibitor after MI if evidence of systolic dysfunction

Diabetes:

- HbA1C measurement/management
- Lipid measurement/management
- Aspirin and ACE inhibitor use
- Eye examination
- Foot exams

Cerebrovascular Disease

Warfarin use in atrial fibrillation

Prevention:

- Adult immunizations (Flu, pneumonia, and Td)
- Pediatric immunizations (non-Medicare measure)

CHF:

- ACE inhibitor use
- Documentation of systolic function measurement
- Breast cancer screening
- PAP smears
- Colorectal cancer screening
- Foot exams





Home



Welcome to the Leapfrog Computerized Physician Order Entry (CPOE) Web-based evaluation. The CPOE Evaluation is a remote test for use by hospitals and ambulatory care offices to assess their compliance with The Leapfrog Group's CPOE and ambulatory standards

The overarching goal is to assist
The Leapfrog Group in its nationwide effort to
improve patient safety.

Hospital ID:	
Security Code:	
User Name:	
Password:	
Login Forgot password?	

Only member hospitals and ambulatory care offices can take the CPOE evaluation test. To become a member, please contact the Administrator at ###-### to obtain an ID and security code. You should receive a security code via e-mail within two business days. If you have any questions, please call The MedStat Group at (734) 913-3333.

- . You must use your security code to gain access to the CPOE Test instructions, content, and to submit your responses to the CPOE questions and test.
- · For multi-hospital systems, each hospital will need to obtain its own unique ID and security code.

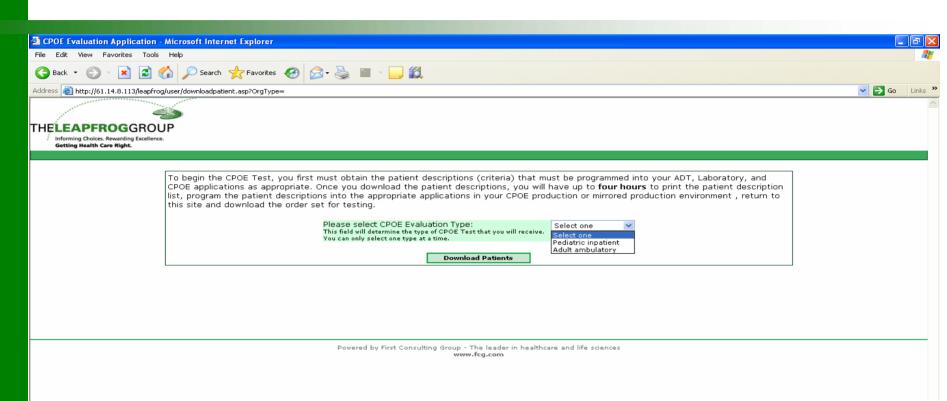
Note: This application loads properly only in Internet Explorer.

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www.fcq.com

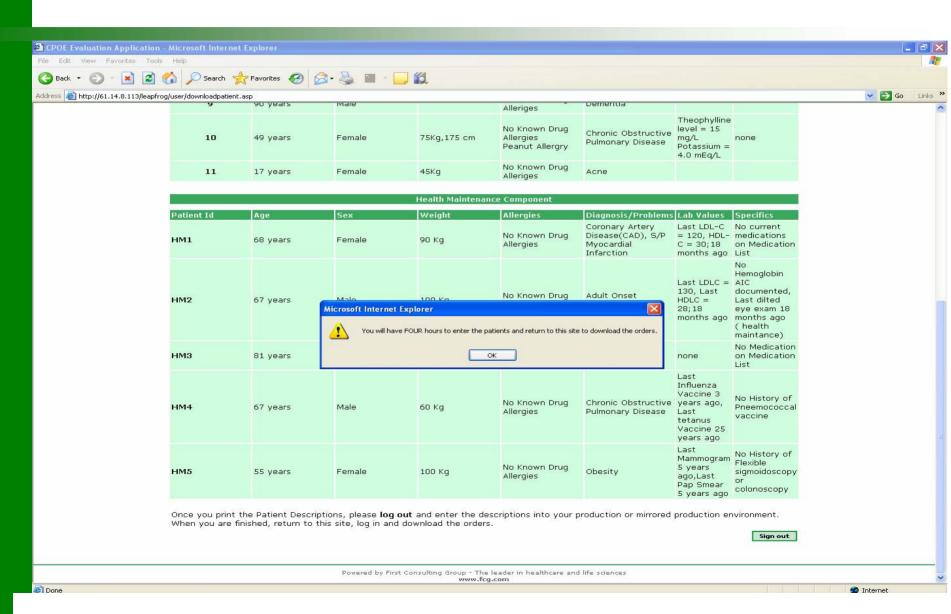
Select Evaluation Type





Obtain Patient Descriptions





Download Orders and Worksheet



CPOE Evaluation Application - Micros	oft Internet Explorer			
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THELEAPFROGGROUP Informing Choices. Rewarding Excellence. Getting Health Care Right.				
order	e print the orders shown below and enter the orders into yo including the alert message then return to this site to subm at Orders		tion for the appropriate patients. Record the results of each	
Numl	per Order	Patient	Result (Check One)	
1	Levothroid 200 mcg po twice daily	1	☐ Alert or Information Received or Order Blocked.DisPlayed Message: ☐ Order Accepted, No Alert or Information Received ☐ Medication Not on Formulary	
2	Cephalexin 250 mg po four times a day	1	☐ Alert or Information Received or Order Blocked.DisPlayed Message: ☐ Order Accepted, No Alert or Information Received ☐ Medication Not on Formulary	
3	Lovenox 80 mg subcutaneous every 12 hours	1	Alert or Information Received or Order Blocked.DisPlayed Message: Order Accepted, No Alert or Information Received Medication Not on Formulary	
4	Demerol 50 mg po every 4 to 6 hours as needed	1	Alert or Information Received or Order Blocked.DisPlayed Message: Order Accepted, No Alert or Information Received Medication Not on Formulary	
5	1) Metoprolol 50 mg po twice daily,2) Toprol XL 100 mg po daily	2	Alert or Information Received or Order Blocked.DisPlayed Message: Order Accepted, No Alert or Information Received Medication Not on Formulary	
6	1) Lotrel 5 mg/10 mg po daily,2) Enalapril 5 mg po daily	2	☐ Alert or Information Received or Order Blocked.DisPlayed Message: ☐ Order Accepted, No Alert or Information Received ☐ Medication Not on Formulary	
7	Hydrocodone/Acetaminophen 5 mg/500 mg (Vicodin) 2 tablets po every four hours	2	Alert or Information Received or Order Blocked.DisPlayed Message: Order Accepted, No Alert or Information Received Medication Not on Formulary	
8	Vicodin ES one tablet every 6 hoursTylenol 500mg po every 4 hou prn	rs 2	Alert or Information Received or Order Blocked.DisPlayed Message:	▽

Download Health Maintenance Worksheet

🥞 start

CPOE Evaluation Appl...

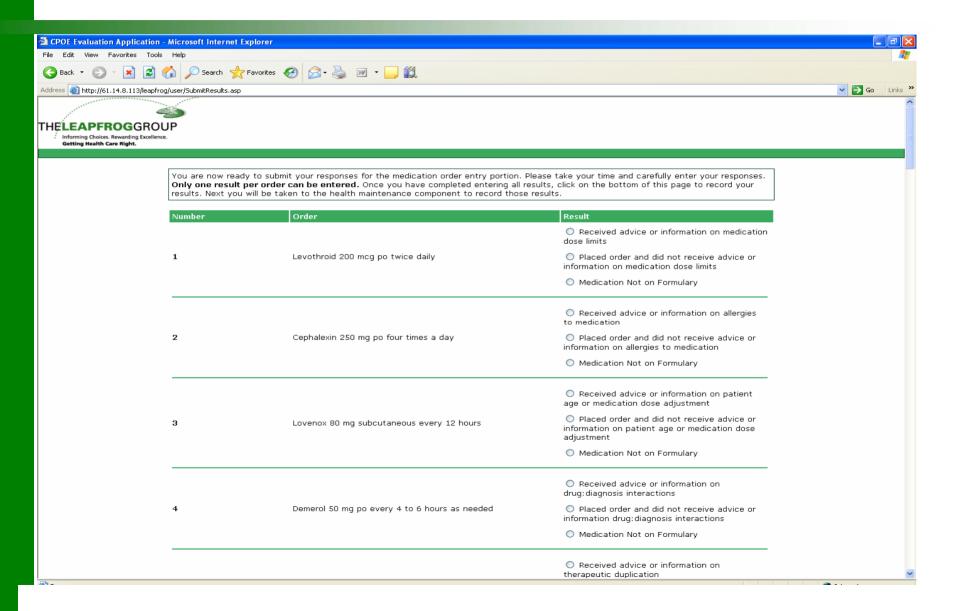
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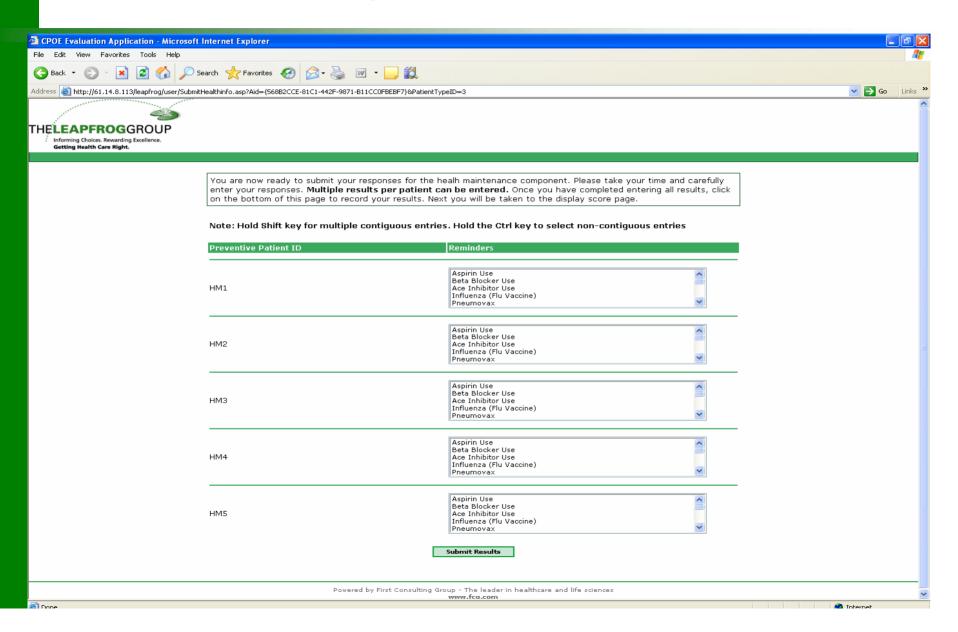
Submit Responses





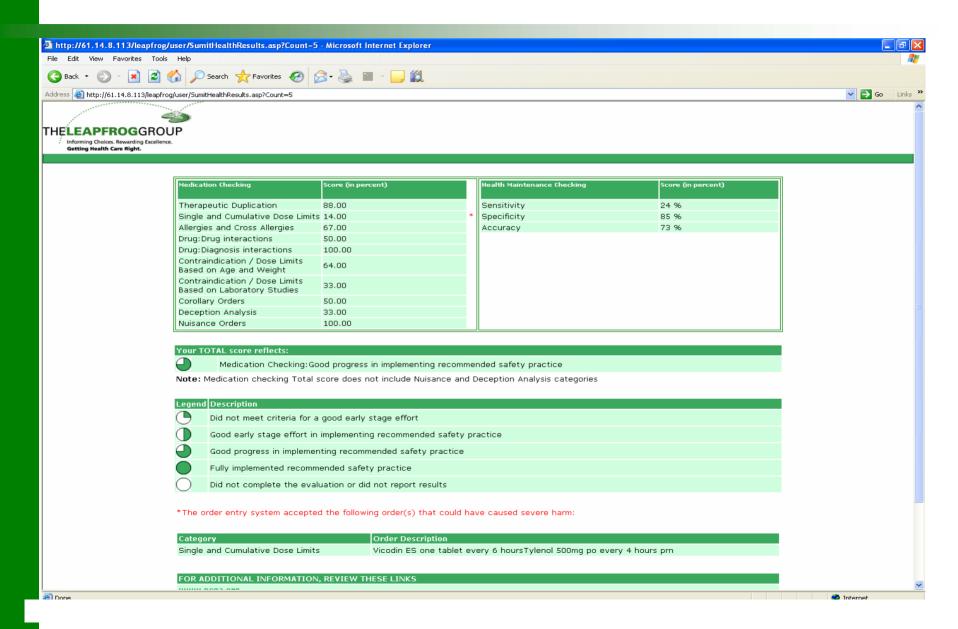
Submit HM Responses





View Results





Results At One Organization Things They had in place



Therapeutic Duplication	B-
Drug-Allergy	C+
Drug-Drug Interactions	C (no drug-food)
Normal Order Alerts	A-

Results at One Organization Things they did not have in place



Corollary Orders	F
Duplicate Test	F
Dose Limits	F
Drug-disease	F
Drug-Lab	F
Wrong route	D-

What They did with the results



- If one looks at our error tracking mechanisms
 - We needed to focus on
 - ✓ Drug dosing
 - ✓ Potentially drug-lab
- Had been thinking about dosing, but no pre-built knowledge base that could easily be used for it.
- Pharmacy review of pre-configured allergy and drug-drug alerts.
- Review of important food allergies (not so easy as you might think...)
- Pharmacy/physician review of important corollary orders.
- Incorporate new functions into our next big re-build of the CPOE system

Conclusions



- Benefits of the test:
 - Makes very transparent the quality of reactive alerts for errors of commission or omission
 - Provides a very nice impetus to get started on fixing up your CDS
 - When linked to public reporting that impetus will be that much stronger
 - Provides a clear set of categories to help plan your
 CDS improvement strategy

Table 2 Decision support at test sites by category

Category	Number of test sites providing decision support in this category (n = 6)
Therapeutic duplication Single/cumulative dose limits Drug allergy Contraindicated route Drug-drug interaction Drug-diagnosis interaction	2 most test orders 2 selected medications 5 3 most test orders 1 selected medications 5 0
Drug-laboratory interaction Drug-radiology procedure interaction Corollary orders Cost of care	0 3 1



Questions?